Exchange Rate Policy: A Disguised Determinant of China's Trading Partners

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Abstract

The study examined the role of Chinese official exchange rate in the selection process of china's trading regions. Interestingly, it is found that the Chinese exchange rate is an important determinant of the trade shifting from one region to another. This is done through employing macroeconomic modelling based on error correction equations. For this, China's exports and imports are divided into 20 categories through 20 separately estimated short run and long run equations. The annual dataset is taken from W.D.I databank for the period 1908-2016. As a popular suggestion from different institutions, it was examined that how the appreciation of Chinese currency would affect the convergence (divergence) of China's trade towards (from) a particular region? Also, the outcome comparison between one time appreciation and gradual appreciation of exchange rate is also examined. It is found that besides inter regional and international political factors, Chinese exchange rate gradually diverge China's trade from high income economies and middle- and low-income economies in Europe and Central Asia to the other regions. The exchange rate appreciation will reduce the pace of this divergence (and convergence to the other regions). The magnitude of reduction in pace is greater in case of a onetime appreciation of currency as compared to the gradual appreciation.

Keywords: Exchange Policy rate, role of Chinese official exchange rate, trading Partners.

Introduction

Renminbi (RMB) or Yuan was kept on a constant nominal level despite numerous attempts by United States to force china to appreciate its currency[1]. Regardless to economic growth, rise in exports and increase in productivity china managed its currency to a constant nominal level since 1994 devaluation (Funke and Rahn 2005). In 2005, china announced a major policy shift by making its exchange rate determination through managed floating exchange rate[2].

Bergesten (2004) estimated an undervaluation of 20% to 25% whereas Goldstein and Lardy (2003a & 2003b) assessed it to be 15% to 25%. Many other analysts including Funke and Rahn (2005) evaluated the exchange rate undervaluation of RMB to be around 15 %. Under new exchange rate regime in 2005, the reform policy allowed exchange rate to appreciate gradually over the next few years.

In July 2008, global financial crisis affected the overall global market resulting the decline in demand of Chinese products. This halted the reform policy of appreciating exchange rate (Morrison and Labonte 2013). In 2009, analyst estimated an undervaluation of RMB/Dollar by 12% (Reisen 2009) and 25% (Rodrick).

In 2010, the People's Bank of China (China's Central Bank) resumed the reform exchange rate policy, but the rate of appreciation was considered too slow. From 2010 to 2013, RMB was appreciated by 10.7% where most of the appreciation was in the period of 2010-11 (Morrison and Labonte 2013). Even with this reform policy the undervaluation persisted. Cline (2013) estimated the undervaluation to be 6% while different methodologies range this devaluation to be around 6% to 10% (IMF 2012). Since 2014, People's Bank of China has reversed this gradual incremental appreciation of RMB to Dollar by consistently intervening in currency market. Although china has not fully explained this policy reversal, but analyst considers this as a preventive move to curtail huge capital inflow (Gruber 2014).

Exchange rate effectiveness for determine trading partner is a very interesting topic and researchers (Cheung and Sengupta 2012, Fidan 2006 and Mehare & Edriss 2012) are examining it for both short run and long run. Guechari (2012) examined the impact of REER on Algeria's trade balance. Both short and long run impact was estimated. The data was

[1](In 2008) https://www.reuters.com/article/us-usa-china-obama-currency/obama-says-china-must-stop-manipulating-currency-idUSTRE49S7FQ20081029
In (2016) https://www.bloomberg.com/news/articles/2016-10-14/china-no-currency-manipulator-obama-treasury-says-for-last-time

[2] Methord where exchange rate is determined by market forces (supply and demand) and government regulates it by market intervention.

bifurcated into two broad classifications. First one was Algeria and world and the second was Algeria's trade with United States and France. Using Error Correction Mechanism, the study finds a positive and significant relationship of REER on Algeria's bilateral trade in long run and negative-significant relationship in short run.

Exchange rate can implicitly determine the trading partners (either country or region) of a country. Genc (2014) developed a panel cointegration model to examine the effect of exchange rate on developing countries. The estimation reveals a significant long run relationship of REER and import-export between emerging economies.

Indian non-financial sector has been focused by Cheung and Sengupta (2012). They analysed impact of REER on its export. Dataset from 2000 to 2010 has been used for the study which reveals that firms with small share of export are affected the most by REER fluctuations.

Fidan (2006) studied the relationship between REER and trade in Turkey. Using panel cointegration, the study concluded that REER has a lesser impact on trade (Export and Import). Another study (Alam 2010) observes that REER and exports have insignificant relationship in case of Bangladesh.

Younus and Chowdhury (2014) evaluated the depreciation effect of real exchange rate on exports, imports and trade balance of Bangladesh. Cointegration, error correction mechanism and impulse response functions were used to analyse the relationship. The estimated results shows that real exchange rate has a positive and significant relationship with export, import and trade balance.

This situation arises some important questions related to the selection of China's trading partners. Besides regional and international political factors, there are internal economic factors which potentially can influence the selection of trading countries. In particular, there are three important questions to be addressed by the policy makers in this context.

1. How is the continuation of same exchange rate going to affect the selection of trading regions?
2. To what extent, the appreciation of currency (as suggested by various institutions) will converge (diverge) china towards (from) a particular region?
3. If the exchange rate is to be appreciated, how one time or gradual appreciation of currency will affect the convergence (divergence) towards (from) a particular region?

The study employed macroeconomic modelling framework to address these questions. The previous studies on the subject using time series and macroeconomic modelling framework addresses different aspects of exchange rate and trade linkages however, this is the pioneer

study which model exchange rate as a vital element in China's convergence (divergence) to (from) a particular region as a trading partner. The modelling framework is presented in the next section. Section 3 presents the results and discussion while section 4 concludes the study.

Modelling Framework

The study divided China's exports into 10 categories through 10 separately estimated short run and long run equations. Equation 1 used Merchandise imports from high-income economies as dependent variable while the other 09 equations used Merchandise imports from low and middle income economies in Europe & Central Asia, Merchandise imports from low and middle income economies in Latin America & the Caribbean, Merchandise imports from low and middle income economies in East Asia & Pacific, Merchandise imports from economies in the Arab World, Merchandise imports from low and middle income economies in South Asia, Merchandise imports from low and middle income economies outside region, Merchandise imports from low and middle income economies within region, Merchandise imports from low and middle income economies in Sub-Saharan Africa and Merchandise imports from low and middle income economies in Middle East & North Africa respectively.

Similarly, 10 equations are used to divide China's exports as well. Equation 11 used Merchandise exports to high income economies as dependent variable. The other 09 equations used Merchandise exports to low and middle income economies in Europe & Central Asia, Merchandise exports to low- and middle income economies in Middle East & North Africa, Merchandise exports to low and middle income economies in Sub-Saharan Africa, Merchandise exports to low- and middle income economies within region, Merchandise exports to economies in the Arab World, Merchandise exports to low and middle income economies in East Asia & Pacific, Merchandise exports to low and middle income economies in Latin America & the Caribbean, Merchandise exports to low and middle income economies in South Asia and Merchandise exports to low and middle-income economies outside region respectively.

The data for imports to a particular region is taken as percentage of total merchandise imports whereas the data for exports is taken as percentage of total exports to a region. China's real GDP per capita, official exchange rate, real interest rate and broad money as percentage of GDP are used as explanatory variables in the equations. The dataset for these variables is taken from World Development Indicators (WDI) databank from 1980 to 2016.

For out of sample forecast (2017 to 2021), the exogenous variables are assumed to grow at the average rate of last five year's growth. Pre sample forecast performance is tested through RMPSE whereas out of sample performance is tested through stochastic simulations[3].

Results and discussion

Empirical analysis starts with testing the level of stationarity associated with each variable in question. To do that, the study adopted augmented version of Dickey Fuller test (ADF test) equation used in the augmented version is as follows:

$$\Delta A_t = \beta_0 + \beta_1 A_{t-1} + \sum_{k=1}^{n} d_k \Delta A_{tk} + \varepsilon_t$$

In this equation, A_t is a time series, Δ is used as first difference operator whereas ε_t is a white noise error term. Augmented Dickey Fuller (ADF) test determines whether the estimates of coefficients are equal to zero. The test is applied on all variables in the model the results found all variables to be integrated of order one[4].

Followed by the ADF test, the Johansen method is used to test long run relationship between variables in all equations in the model. The method begins with the vector auto-regression of order p as follows:

$$z_t = \delta + B_t z_{t-1} + \cdots + B_p z_{t-p} + \varepsilon_t$$

Here z_t is a vector of first difference stationary variables having n x1 dimensions whereas ε_t is a n x1 vector of associated errors. The vector auto-regression form is presented as follows:

$$\Delta z_t = \delta + \Phi\, z_{t-1} + \sum_{i=1}^{p-1} \mathrm{r}_i \Delta z_{t-1} + \varepsilon_t$$

$$\text{Where } \Phi = \sum_{i=1}^{p} B_i - I \text{ and } \mathrm{r}_i = -\sum_{j=i+1}^{p} B_j$$

In case the matrix Φ has reduced rank r < n, there exist n x r matrices α and β each with rank r in such a way that ensures $\Phi = \alpha\beta'$ and $\beta' z_t$ is stationary. Here r represents the number of cointegrating relationships, α is the adjustment parameter in the VECM (Vector error correction model) whereas every column of β represents a cointegrating vector. Given r, the maximum likelihood estimator (MLE) of β states a combination of z_{t-1} which provides the the *r* largest canonical correlations of Δz_t with z_{t-1} after correcting for lagged differences and deterministic variables when present. There are two likelihood ration tests to check the

[3] Results are available upon request.
[4] Results are available upon request.

statistical significance of these canonical correlations and thus the reduced rank of $\Phi\ metrix$ namely trace statistics and maximum Eigen value statistics stated as follows:

$$J_{trace} = -S\sum_{i=r+1}^{n} Ln(1-\lambda_i) \quad \text{and} \quad J_{max} = -S\ln(1-\lambda_{r+1})$$

Here S represents the sample size and λ_i is the i[th] largest canonical correlation. The estimated results of Johansen and Juselius method confirmed the existence of long run relationship between variables in all the equations.

It is appropriate at this stage to test the short run relationship between variables in the import demand function. This is done by employing error correction mechanism (ECM) as follows:

$$\Delta M_t = \Phi_0 + \Phi_1 \sum_{i=1}^{p} \Delta Y_t + \Phi_2 \sum_{i=1}^{p} \Delta OER_t + \Phi_3 \sum_{i=1}^{p} \Delta r_t + \Phi_4 \sum_{i=1}^{p} \Delta M2_t + \Phi_5 \mathrm{EC}_{t-1} + \varepsilon_t$$

ΔM_tsymbolises the first difference of dependent variable in the equation while the variables on the right-hand side of equation are same as in the long run function except two differences. First, the variables as well as their first lag are used in first differenced form expressed through Δ and second, the first lag of error correction term is included along with the other explanatory variables in the model. Here, Φ_5 is the magnitude of long run model adjustment in response to a short run shock.

The study employs equations in the error correction framework to estimate the coefficients of short run model after establishing the long-term relationship using Johansen Cointegration technique.

Baseline

In all the analysis followed, increase or decrease in exports or imports would be in relative terms (as compared to the total merchandise exports or imports[5]. The baseline scenario assumed that there is no change in the official exchange rate during forecast period. The results shows that the baseline scenario will decrease the imports from high income economies and from the low- and middle-income economies in Europe and Central Asia. The imports from remaining regions are found to be increased during the forecast period. For exports, the results shows that exports to all regions would increase except for the exports to the high-income economies which would decline gradually. The results shows that besides regional and international political factors, official exchange rate has the ability to diverge trade from one region to another region.

[5] For instance, relative decrease in imports from a region does not necessarily imply lower monetary value of imports.

After knowing exchange rate's influence in the shifting of trade from one region to another region, it is relevant to find out the answers of the two other questions raised in the section 1. To address the raised questions, the next sub section presents two scenarios.

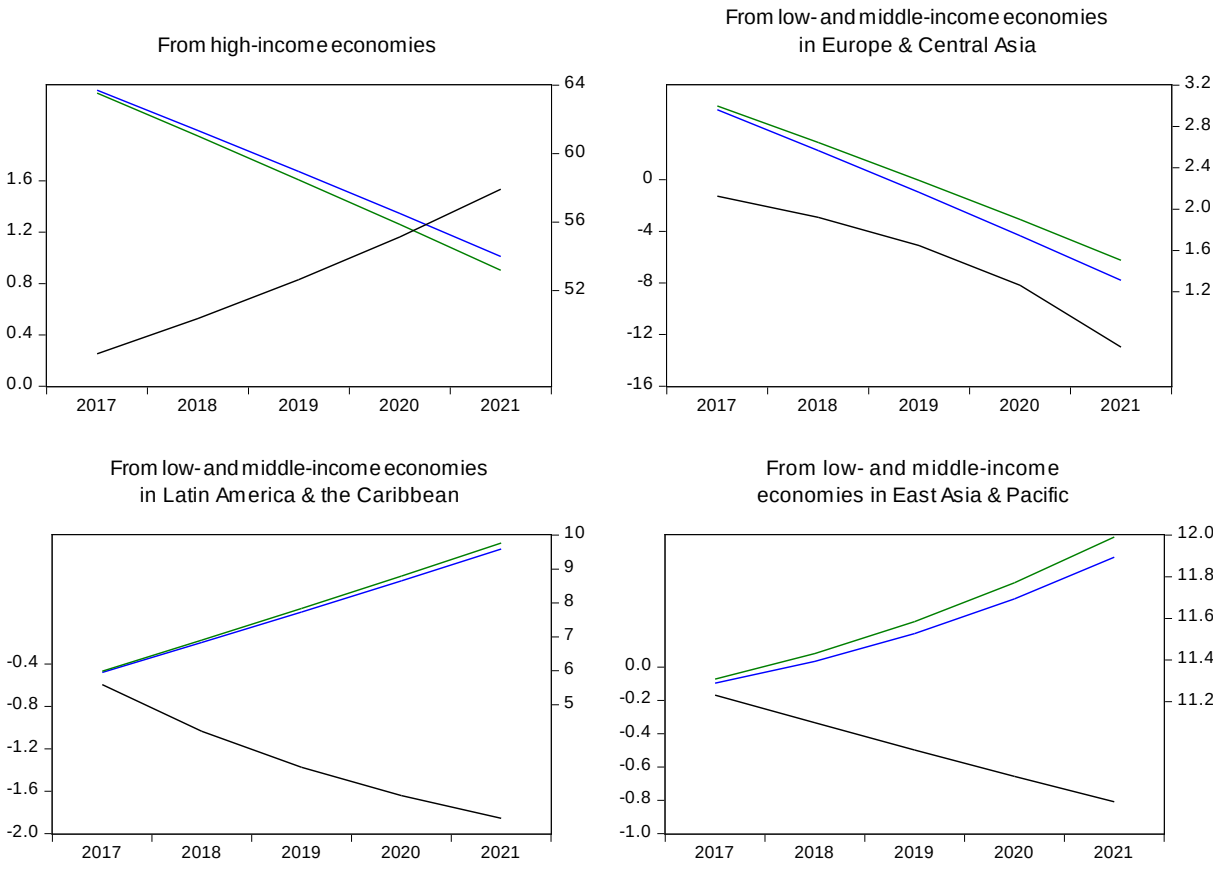
Scenario analysis

After establishing the baseline for 2017 to 2021, the study test 2 scenarios as follows:

1. 1 percent appreciation of Chinese currency every year in the forecast period.
2. One time appreciation of Chinese currency by 5 percent.

The outcome of these scenarios is presented in Figure 1 to 4 while the values are presented in the appendix 1.

Figure 1
Effect of 1 percent appreciation of nominal exchange rate on Import



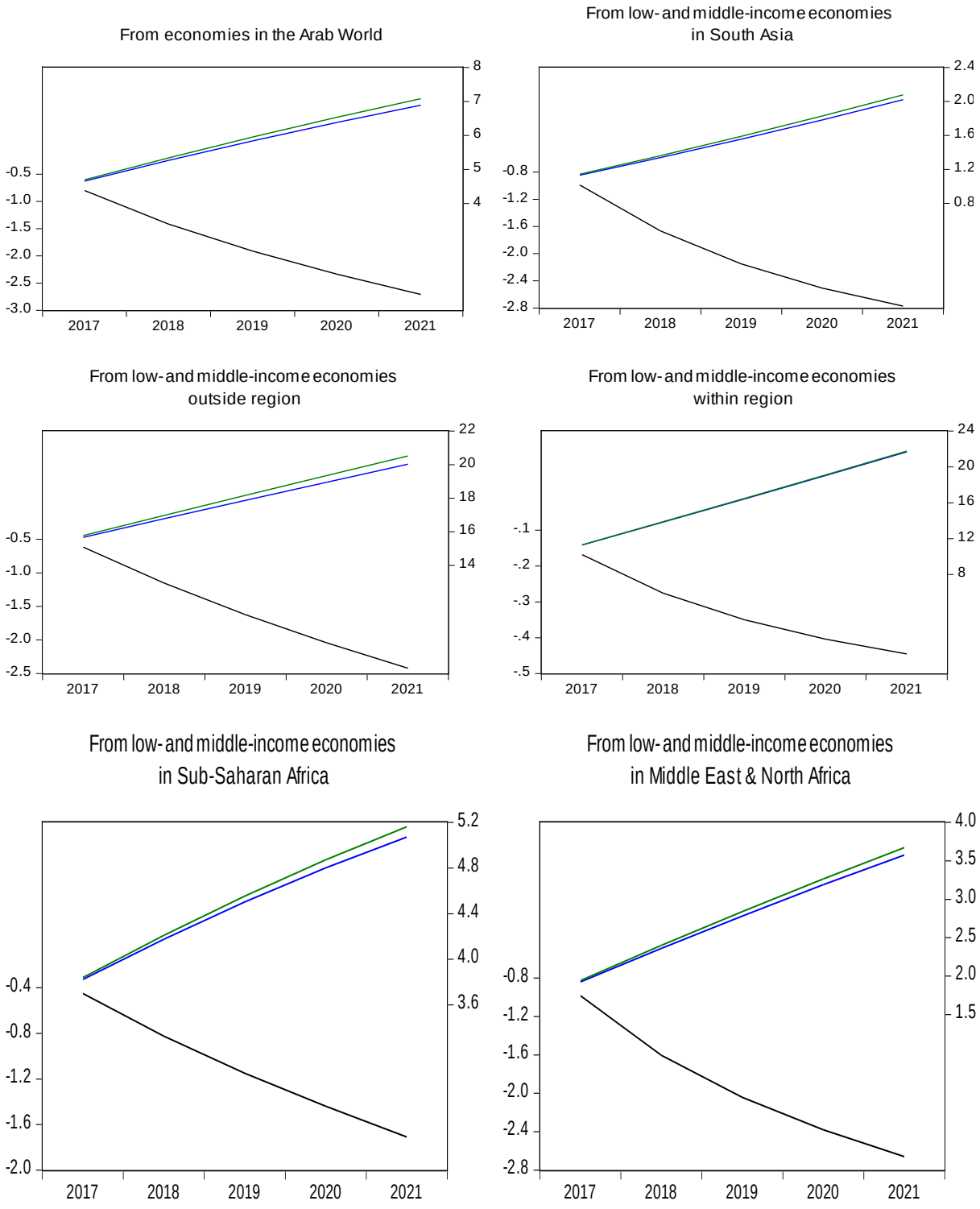
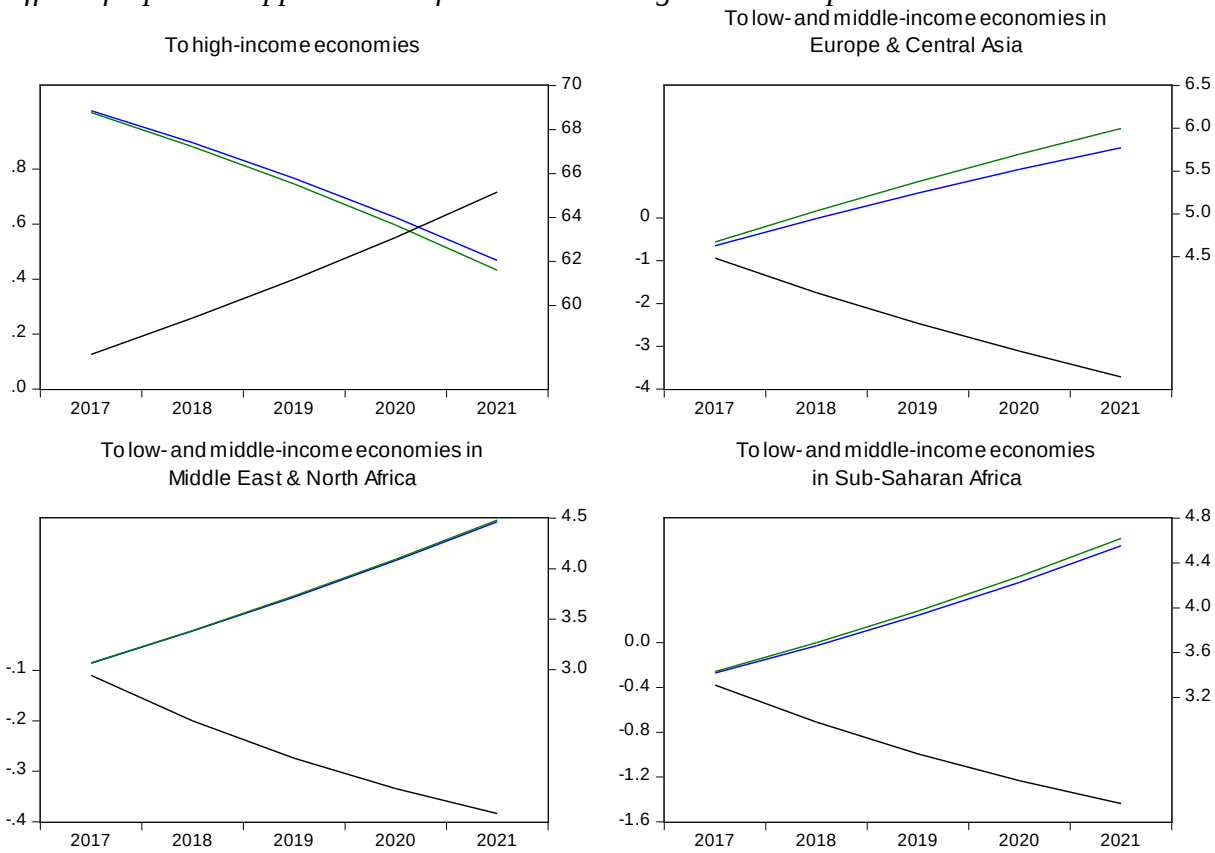

From economies in the Arab World
From low- and middle-income economies in South Asia
From low- and middle-income economies outside region
From low- and middle-income economies within region
From low- and middle-income economies in Sub-Saharan Africa
From low- and middle-income economies in Middle East & North Africa
2017
2018
2019
2020
2021
Scenario
Baseline
Percentage deviation

Figure 2
Effect of 1 percent appreciation of nominal exchange rate on Exports



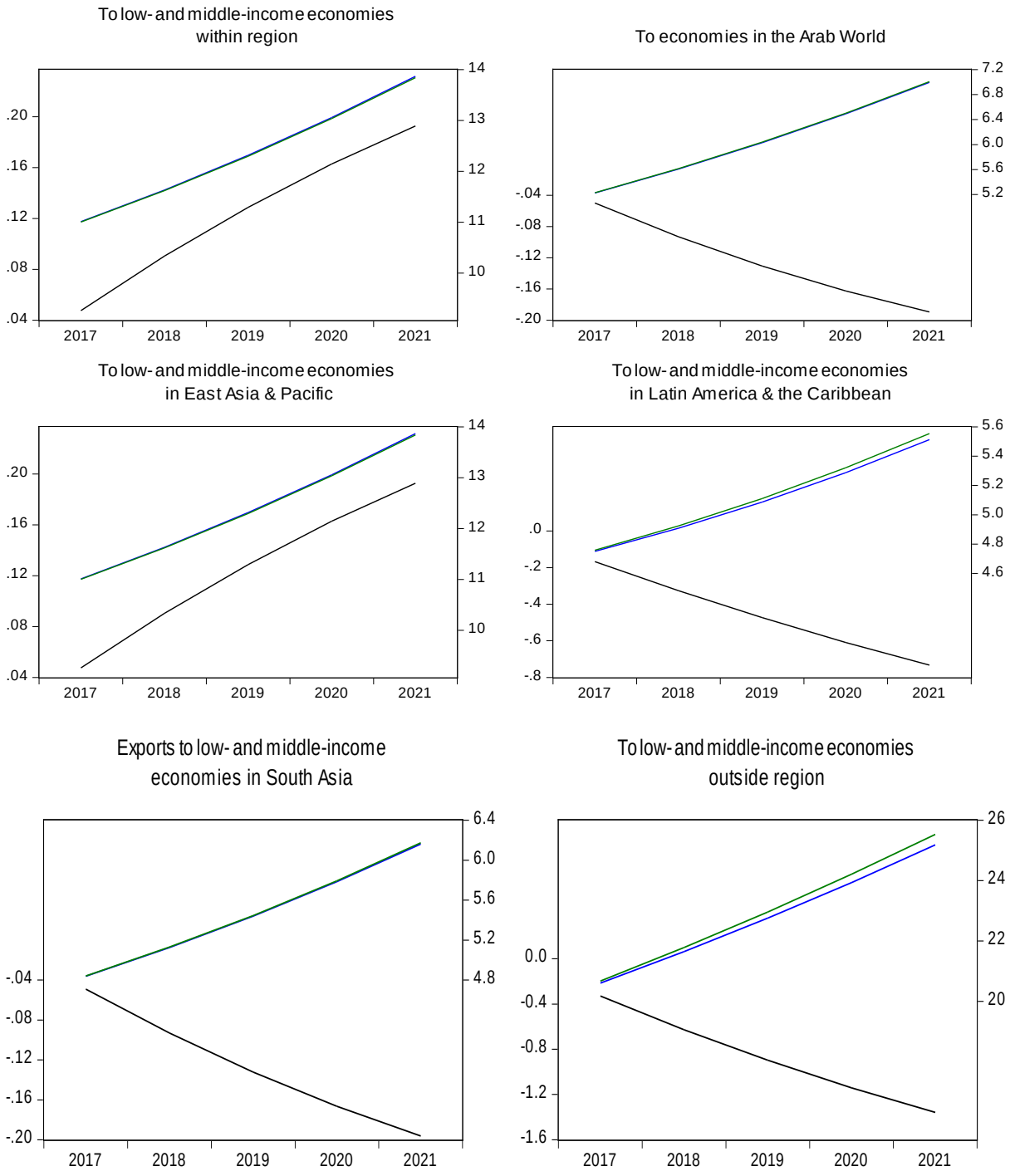
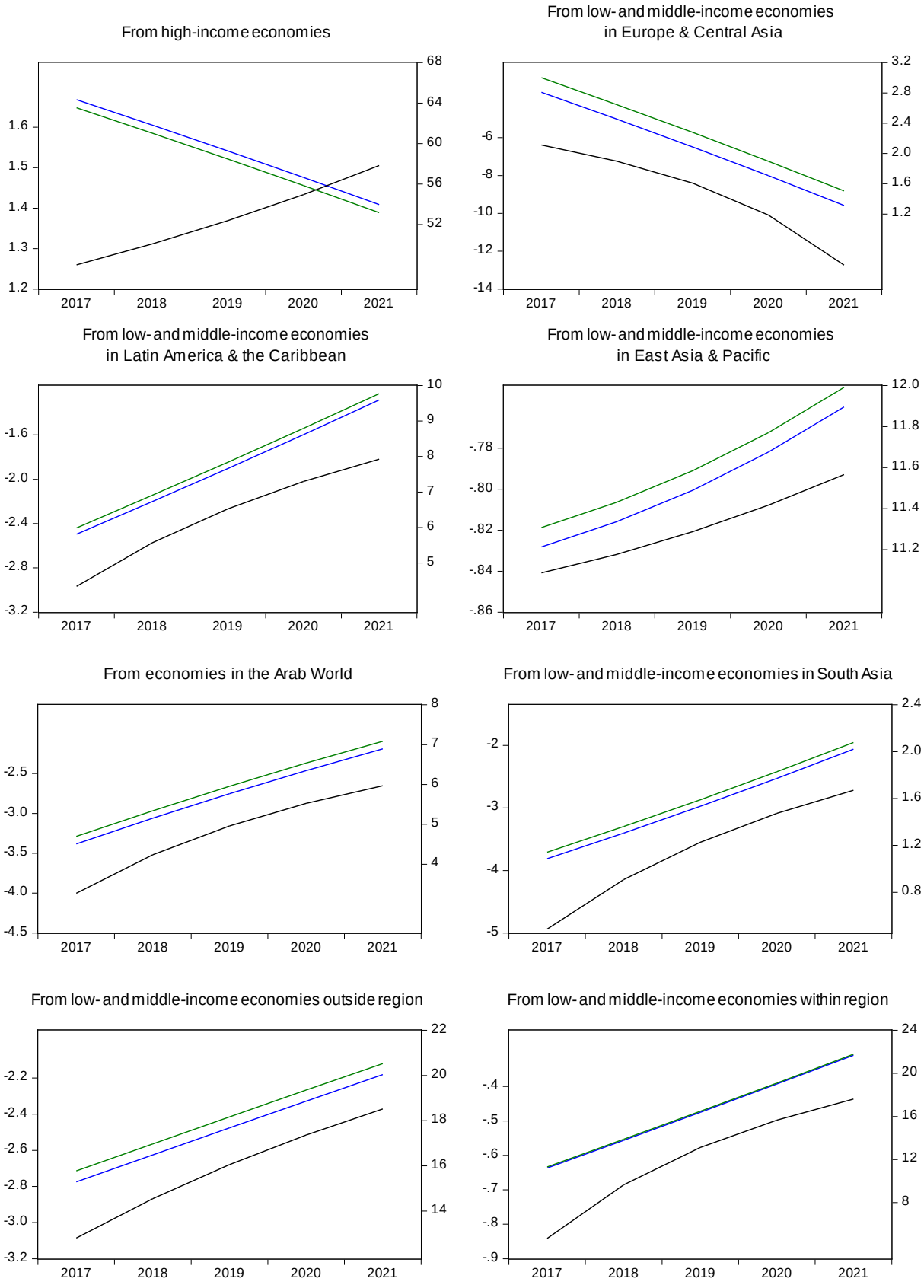

To low- and middle-income economies within region
To economies in the Arab World
To low- and middle-income economies in East Asia & Pacific
To low- and middle-income economies in Latin America & the Caribbean
Exports to low- and middle-income economies in South Asia
To low- and middle-income economies outside region
2017
2018
2019
2020
2021
Scenario
Baseline
Percentage deviation

Figure 3
Effect of one-time appreciation of Chinese currency by 5 percent on Imports



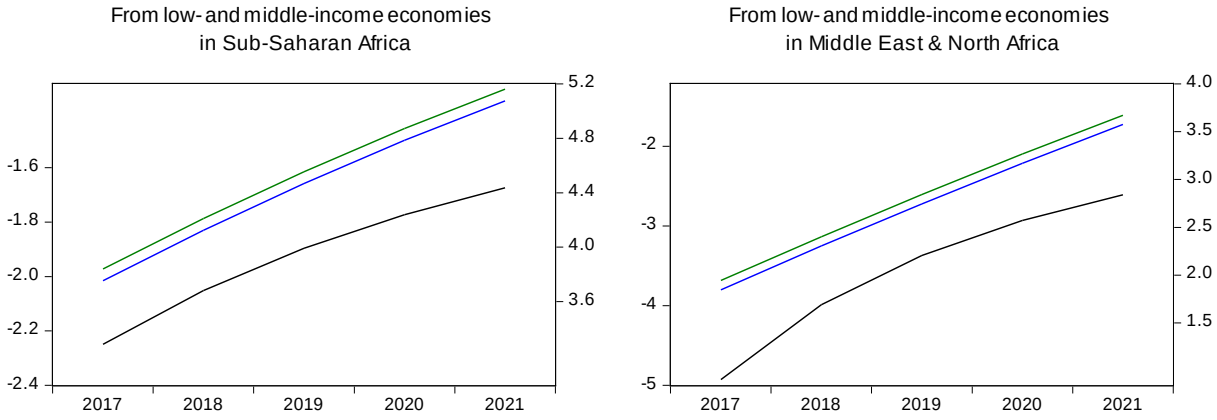
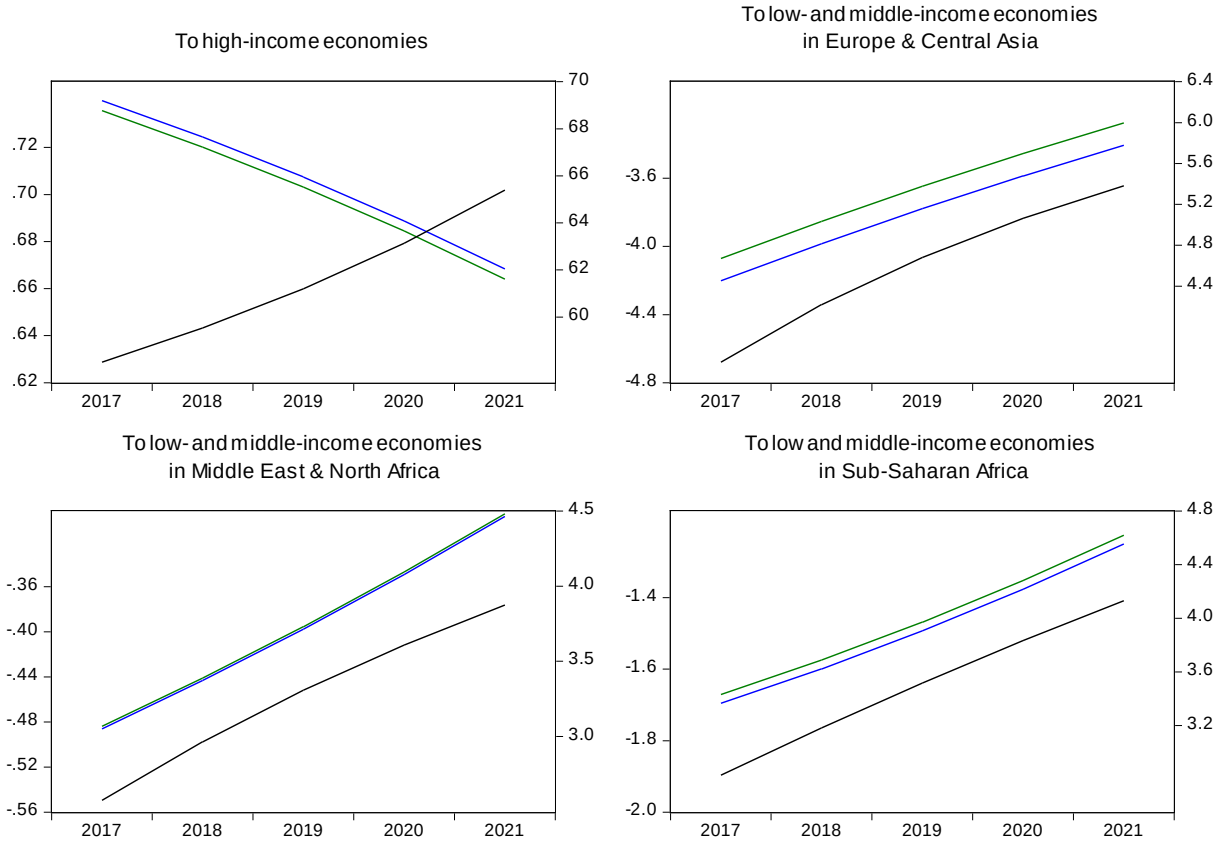
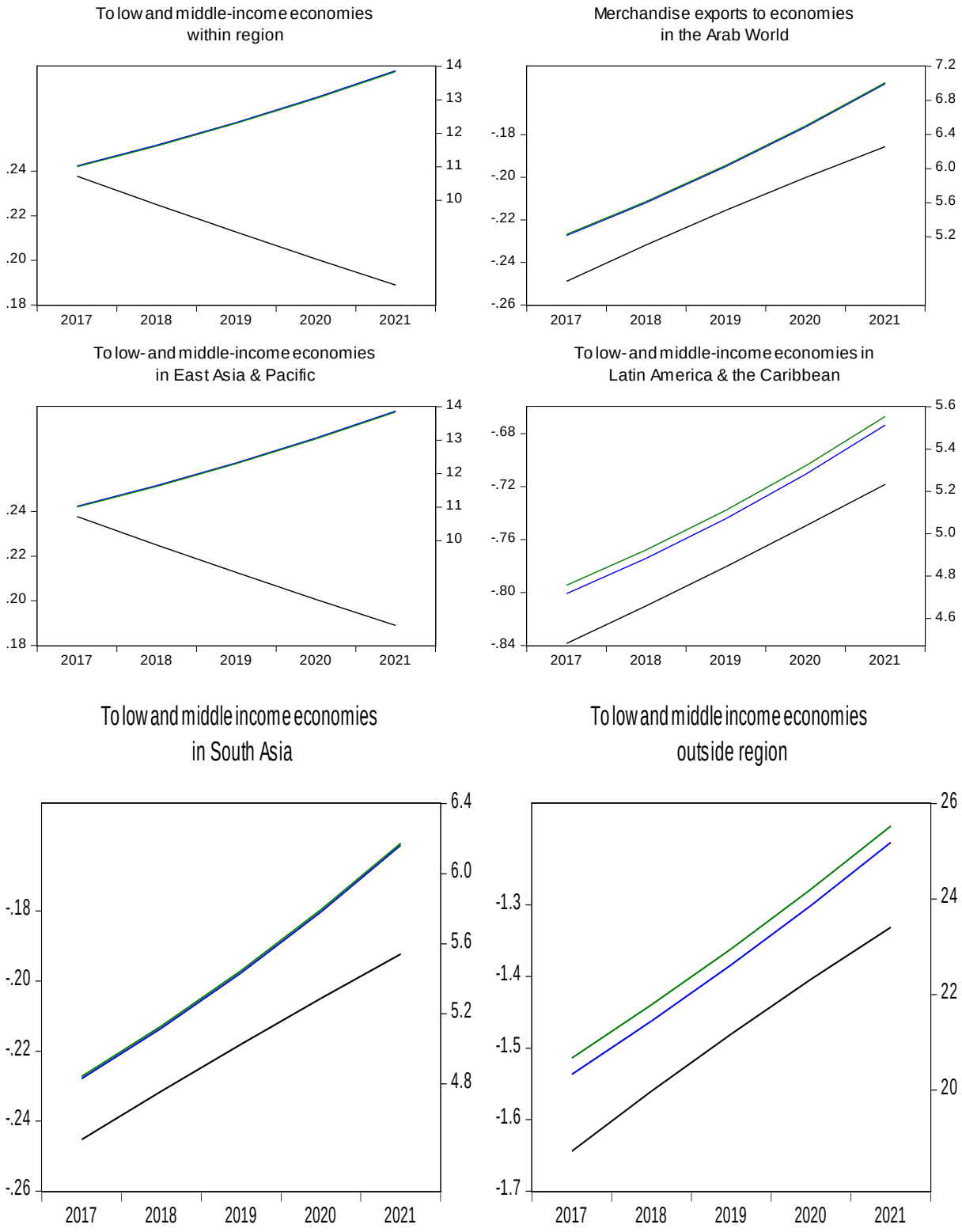


Figure 4
Effect of one-time appreciation of Chinese currency by 5 percent on Exports




To low and middle-income economies within region
Merchandise exports to economies in the Arab World
To low- and middle-income economies in East Asia & Pacific
To low- and middle-income economies in Latin America & the Caribbean
To low and middle income economies in South Asia
To low and middle income economies outside region
2017
2018
2019
2020
2021
Scenario
Baseline
Percentage deviation

As shown, the appreciation of currency by 1 percent every year will reduce the pace of falling imports from high income economies. In case of low- and middle-income economies, the fall in merchandise imports shifted to 1.3 percent lower initially and the difference reached to 13 percent at the end of period. This implies that a gradual appreciation is likely to reduce the pace of import reduction from high income economies and increase the same in case of low- and middle-income economies in Europe and Central Asia.

Exports is also found to decrease with a lesser magnitude starting from 0.13 percent deviation from baseline to 0.72 percent at the end implying that the process of reduction in exports would decrease in under this scenario. Exports to middle- and low-income economies in Europe and Central Asia are found to increase with a lesser magnitude and the deviation from baseline increased with time reaching to 3.72 percent at the end of period.

Imports from the other regions increases in the baseline case however in the scenario 1, the low- and middle-income economies in South Asia is the most effected region while the low- and middle-income economies within region the least effected region though the imports in this scenario found to be lower than the baseline.

Exports to the other regions increases in the baseline as well as in this scenario. However, the deviation from baseline is highest in case of low- and middle-income economies in Europe and Central Asia where exports were found to be 0.94 percent lesser than baseline and it was 3.72 percent lesser at the end of period. In case of low- and middle-income economies in East Asia & Pacific, the deviation in this scenario is found to be least starting from 0.05 percent at the beginning and reached to 0.19 percent at the end.

The results show that appreciation would reduce the pace of trade diversion from high income economies while increase the pace of trade diversion from low- and middle-income economies in Europe and Central Asia under scenario 1. At the same time, the Chinese economy's trade would converge towards the other regions with the passage of time and the scenario 1 would reduce the pace of convergence.

In response to the scenario 2, the imports from high income economies increased by 1.26 percent from baseline at the starting period and then the deviation increased and reached to 1.54 percent at the end of period. Interestingly, the level of imports at the ending period is same despite of the difference in the time paths. For low- and middle-income economies in Europe and Central Asia, the imports fall to 6.4 percent at the starting period and the deviation reaches to 12.7 percent at the end of period.

Exports to high income economies started at 0.63 percent lower level initially however the deviation remained almost same throughout the period. Exports to low- and middle-income

economies in Europe and Central Asia found to be 4.68 percent lower at the initial level and this deviation decreased with time and reached to 3.64 percent at the end of period.

The process of trade diversion speeds up under scenario 2 for the low- and middle-income Economies in Europe and Central Asia and the same process becomes lower for high income economies under this scenario. At the same time, the scenario 2 shows that the pace of China's trade convergence towards other regions would be lower in the scenario 2.

Conclusion

The study examines available empirical evidence of Chinese currency's influence on the selection process of china's trading regions. Interestingly, it is found that the Chinese exchange rate is an important determinant in determining the trade shifting from one region to another.

After establishing the role of exchange rate in this process, the study employed short run error correction equations to simulate macroeconomic model in order to answer two important questions. As a popular suggestion from different institutions, it was examined that how the appreciation of Chinese currency would affect the convergence (divergence) of China's trade towards (from) a particular region? Also, the outcome comparison between one time appreciation and gradual appreciation of exchange rate is also examined.

It is found that besides inter regional and international political factors, Chinese exchange rate gradually diverge China's trade from high income economies and middle- and low-income economies in Europe and Central Asia to the other regions. The exchange rate appreciation will reduce the pace of this divergence (and convergence to the other regions). The magnitude of reduction in pace is greater in case of a onetime appreciation of currency as compared to the gradual appreciation.

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Appendix 1

Imports in Scenario 1

		2017	2018	2019	2020	2021
I1	S1	63.7	61.4	59	56.5	54
	B. L	63.5	61	58.5	55.9	53.2
	per dev	0.25	0.53	0.83	1.16	1.54
12	S1	2.96	2.57	2.16	1.74	1.31
	B. L	3	2.64	2.28	1.9	1.51
	per dev	-1.3	-2.9	-5.1	-8.2	-13
i3	S1	5.95	6.83	7.73	8.65	9.59
	B. L	5.99	6.9	7.84	8.79	9.77
	per dev	-0.59	-1.03	-1.37	-1.64	-1.86
i4	S1	11.3	11.4	11.5	11.7	11.9
	B. L	11.3	11.4	11.6	11.8	12
	per dev	-0.17	-0.33	-0.5	-0.66	-0.81
i5	S1	4.66	5.27	5.84	6.38	6.89
	B. L	4.7	5.34	5.96	6.54	7.08
	per dev	-0.8	-1.41	-1.91	-2.33	-2.71
i6	S1	1.13	1.34	1.56	1.78	2.02
	B. L	1.14	1.36	1.59	1.83	2.08
	per dev	-0.99	-1.67	-2.15	-2.51	-2.77
i7	S1	15.7	16.8	17.9	19	20
	B. L	15.8	17	18.2	19.4	20.5
	per dev	-0.62	-1.15	-1.62	-2.04	-2.42
i8	S1	11.3	13.8	16.4	19	21.7
	B. L	11.3	13.9	16.5	19.1	21.8
	per dev	-0.17	-0.28	-0.35	-0.4	-0.45
i9	S1	3.82	4.18	4.5	4.8	5.07
	B. L	3.84	4.21	4.56	4.87	5.16
	per dev	-0.45	-0.82	-1.15	-1.44	-1.71
i10	S1	1.92	2.36	2.78	3.19	3.57
	B. L	1.94	2.4	2.84	3.27	3.67

	per dev	-0.99	-1.6	-2.04	-2.38	-2.66

Exports in Scenario 1

		2017	2018	2019	2020	2021
e1	S1	68.9	67.4	65.8	64	62
	B. L	68.8	67.2	65.5	63.7	61.6
	per dev	0.13	0.26	0.4	0.55	0.72
e2	S1	4.63	4.95	5.24	5.52	5.77
	B. L	4.67	5.03	5.38	5.7	6
	per dev	-0.94	-1.75	-2.46	-3.11	-3.72
e3	S1	3.06	3.38	3.72	4.08	4.46
	B. L	3.07	3.39	3.73	4.09	4.48
	per dev	-0.11	-0.2	-0.27	-0.33	-0.38
e4	S1	3.42	3.66	3.93	4.23	4.55
	B. L	3.43	3.69	3.97	4.28	4.62
	per dev	-0.38	-0.71	-0.99	-1.23	-1.44
e5	S1	11	11.6	12.3	13.1	13.9
	B. L	11	11.6	12.3	13	13.8
	per dev	0.05	0.09	0.13	0.16	0.19
e6	S1	5.23	5.61	6.03	6.49	7
	B. L	5.23	5.62	6.04	6.5	7.01
	per dev	-0.05	-0.09	-0.13	-0.16	-0.19
e7	S1	11	11.6	12.3	13.1	13.9
	B. L	11	11.6	12.3	13	13.8
	per dev	0.05	0.09	0.13	0.16	0.19
e8	S1	4.75	4.91	5.09	5.29	5.51
	B. L	4.76	4.92	5.11	5.32	5.55
	per dev	-0.17	-0.33	-0.47	-0.61	-0.73
e9	S1	4.84	5.12	5.44	5.78	6.16
	B. L	4.84	5.13	5.45	5.79	6.17
	per dev	-0.05	-0.09	-0.13	-0.17	-0.2
e10	S1	20.6	21.6	22.8	23.9	25.2
	B. L	20.7	21.8	23	24.2	25.5
	per dev	-0.33	-0.63	-0.9	-1.14	-1.36

Imports in Scenario 2

		2017	2018	2019	2020	2021
I1	S2	64.3	61.8	59.3	56.7	54
	B. L	63.5	61	58.5	55.9	53.2
	per dev	1.26	1.31	1.37	1.43	1.51
12	S2	2.81	2.45	2.09	1.71	1.31
	B. L	3	2.64	2.28	1.9	1.51
	per dev	-6.4	-7.2	-8.4	-10.1	-12.7
i3	S2	5.81	6.73	7.66	8.62	9.59
	B. L	5.99	6.9	7.84	8.79	9.77
	per dev	-2.97	-2.57	-2.27	-2.02	-1.82
i4	S2	11.2	11.3	11.5	11.7	11.9
	B. L	11.3	11.4	11.6	11.8	12
	per dev	-0.84	-0.83	-0.82	-0.81	-0.79
i5	S2	4.51	5.15	5.77	6.35	6.9
	B. L	4.7	5.34	5.96	6.54	7.08
	per dev	-4	-3.52	-3.16	-2.88	-2.65
i6	S2	1.09	1.31	1.53	1.77	2.02
	B. L	1.14	1.36	1.59	1.83	2.08
	per dev	-4.94	-4.14	-3.55	-3.09	-2.72
i7	S2	15.3	16.5	17.7	18.9	20
	B. L	15.8	17	18.2	19.4	20.5
	per dev	-3.09	-2.87	-2.68	-2.52	-2.37
i8	S2	11.2	13.8	16.4	19	21.7
	B. L	11.3	13.9	16.5	19.1	21.8
	per dev	-0.84	-0.69	-0.58	-0.5	-0.44
i9	S2	3.75	4.12	4.47	4.79	5.07
	B. L	3.84	4.21	4.56	4.87	5.16
	per dev	-2.25	-2.05	-1.9	-1.77	-1.67
i10	S2	1.85	2.3	2.75	3.17	3.58
	B. L	1.94	2.4	2.84	3.27	3.67
	per dev	-4.93	-3.99	-3.37	-2.93	-2.61

Exports in Scenario 2

		2017	2018	2019	2020	2021
e1	S2	69.2	67.7	66	64.1	62
	B. L	68.8	67.2	65.5	63.7	61.6
	per dev	0.63	0.64	0.66	0.68	0.7
e2	S2	4.45	4.82	5.16	5.48	5.78
	B. L	4.67	5.03	5.38	5.7	6
	per dev	-4.68	-4.34	-4.06	-3.84	-3.64
e3	S2	3.05	3.37	3.71	4.08	4.46
	B. L	3.07	3.39	3.73	4.09	4.48
	per dev	-0.55	-0.5	-0.45	-0.41	-0.38
e4	S2	3.37	3.62	3.91	4.22	4.55
	B. L	3.43	3.69	3.97	4.28	4.62
	per dev	-1.9	-1.76	-1.64	-1.52	-1.41
e5	S2	11	11.6	12.3	13.1	13.9
	B. L	11	11.6	12.3	13	13.8
	per dev	0.24	0.22	0.21	0.2	0.19
e6	S2	5.22	5.6	6.03	6.49	7
	B. L	5.23	5.62	6.04	6.5	7.01
	per dev	-0.25	-0.23	-0.22	-0.2	-0.19
e7	S2	11	11.6	12.3	13.1	13.9
	B. L	11	11.6	12.3	13	13.8
	per dev	0.24	0.22	0.21	0.2	0.19
e8	S2	4.72	4.88	5.07	5.28	5.51
	B. L	4.76	4.92	5.11	5.32	5.55
	per dev	-0.84	-0.81	-0.78	-0.75	-0.72
e9	S2	4.83	5.12	5.43	5.78	6.16
	B. L	4.84	5.13	5.45	5.79	6.17
	per dev	-0.25	-0.23	-0.22	-0.2	-0.19
e10	S2	20.3	21.4	22.6	23.9	25.2
	B. L	20.7	21.8	23	24.2	25.5
	per dev	-1.64	-1.56	-1.48	-1.4	-1.33